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When citing this work, cite the original article below:

Visnjic Kastalli, I., B. Van Looy and A. Neely. 2013. Steering Manufacturing Firms Towards Service Business Model Innovation. *California Management Review* 56(1): 100-123.

<http://www.jstor.org/discover/10.1525/cmr.2013.56.1.100?uid=3737952&uid=2134&uid=2&uid=70&uid=4&sid=21103378483331>

**Steering Manufacturing Firms Towards Service Business Model Innovation:
Embracing Indicators that Reflect Market Performance**

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ABSTRACT

Increasingly, manufacturing firms are turning to services as a new way of creating and capturing value. Despite the potential benefits, evidence suggests that many new product-service providers struggle to deploy service activities effectively, not least because they fail to reflect the presence of service activities in their performance management systems (PMS). This paper reports the results of an in-depth case study, which examines how manufacturers can steer the transition towards services. Our findings suggest that manufacturing firms need to emphasize two separate but related dimensions of the market performance of service activities: 'service adoption', reflecting the proportion of customers who purchase the manufacturer's services, and 'service coverage', signaling the range of service elements or the comprehensiveness of the service contract that customers opt for. These two indicators, reflecting service market performance, should be supplemented with a 'complementarity index' designed to disclose whether the relationship between products and services is reinforcing or substitutive. This is particularly important, since a common concern expressed by manufacturers is that increasing their service activities may cannibalize their product activities. Combined, these indicators allow manufacturing firms to deploy a service-based business model in an integrated and sustainable manner.

KEYWORDS: servitization, open service innovation, product-service systems, performance measures, business model innovation.

INTRODUCTION

Accelerating global competition, shrinking product innovation cycles, and growth in the number of imitators represent constant threats to manufacturing firms in the developed world today. In the continuous search for new ways of creating and capturing value, many manufacturers are looking for diversification opportunities in service markets related to their products. Recent data suggest that over one-third of large manufacturing firms now offer services, with the proportion increasing to almost 60 percent in the United States.ⁱ This phenomenon has captured the attention of the academic community with contributions on ‘servitization’ⁱⁱ and open service innovationⁱⁱⁱ advancing interesting propositions on the extent of servitization, the value of customer focus, and the innovation potential of services.

A range of expected benefits encourages manufacturers to embrace services. First, firms are motivated by the strategic benefits that services offer in terms of customer loyalty. Services are seen as a way of increasing the customer focus of organizations, thereby strengthening the relationship with the customer.^{iv} In addition, manufacturers are attracted by the direct economic benefits of services. Services are expected to deliver growth and profitability, as well as more stable revenue streams.^v As a result, a growing number of manufacturers have been seeking to redefine their core value propositions, giving greater strategic weight to services as opposed to simply offering services as part of the marketing mix that supports product sales.^{vi}

While recently published studies show that services strongly contribute to customer loyalty, they also highlight the challenges manufacturers face when shifting to services. Indeed, some authors have claimed that a ‘service paradox’ exists – manufacturers appear unable to reap the gains they expect from services because of the difficulty they face in making the transition.^{vii} Large-scale empirical studies analyzing the impact of servitization on the financial performance of firms add fuel to

the fire, providing further evidence of the ‘service paradox’.^{viii} A key theme in the literature is the difficulty in changing organizational direction and focus. This is a challenge that was widely discussed in the mid-1980s when manufacturing firms underwent a major revolution with the adoption of Japanese manufacturing methods. At that time, one of the key constraints was the inappropriate nature of many measurement and accounting systems. While new forms of manufacturing required different ways of working, the traditional accounting and measurement systems often held firms back.^{ix} In many cases, measurement systems were myopic – driving the wrong behaviors in modern manufacturing firms. Today, we are witnessing a new shift in manufacturing – towards services. Should we not therefore revisit the performance measures employed by product manufacturers?

Service management scholars recognize the need for new, service-specific measures of performance and stress the importance of service quality^x, customer satisfaction and loyalty^{xi}, and provider-customer relations^{xii} as performance measurements. Along with the well-known customer satisfaction-related concepts such as the service-profit chain^{xiii}, these performance measurement concepts are readily adopted by product-service providers and scholars interested in the service strategies of product firms. At the same time, *market performance* measures for product-service providers seem to be missing. While this has, thus far, made analysis of the impact of services on performance difficult^{xiv}, it is even more problematic from the perspective of steering the product-service provider towards the successful implementation of a service business model.^{xv}

The question of the market performance of a product-service business is particularly apposite given the interplay that exists between product and service sales; both activities can display a complementary, mutually reinforcing relationship as well as a

substitutive one. If a firm is too focused on product-based metrics (and evaluated according to them), management, as well as the sales force, may be tempted to give away services in order to secure product sales, knowing that, in doing so, performance measures will not be adversely affected. Thus, we argue that it may be time to revisit the question of market performance measurement for product-service providers, and we posit the following question to channel our research efforts: ***“What key performance indicators should a servitized manufacturer (or product-service provider) use to reflect the performance of both the product and the service businesses”***

Working in close collaboration with the senior management of a global ‘manufacturer turned product-service provider’, Atlas Copco, and the management of 10 of their country subsidiaries, we examined the key market-performance indicators introduced to support the process of adopting services. The results of our analysis suggest that, besides customer-satisfaction measures that span products and services, a successful product-service provider requires market-performance measures that reflect the entire range of the product-service business. More specifically, a future product-service provider should complement its product-oriented measures of market performance (e.g. market share) with measures that depict the market success of service activities. In addition, servitizing firms should explicitly acknowledge and monitor the interaction between product and service activities. This study has resulted in clear recommendations for manufacturers contemplating a business model based on service innovation: adequate implementation requires an *integrated* set of market-performance indicators for products and services as well as for the relationship between them; combining and balancing different indicators is instrumental for the gradual, well-paced implementation of the services business.

PRODUCT-SERVICE PROVIDERS: IMPORTANCE OF MARKET PERFORMANCE

The tendency of manufacturing companies to move towards services has been noted in several research communities. The label ‘servitization’ was first coined by Vandermerwe and Rada (1988) to delineate the tendency of manufacturing firms to “offer fuller market packages or ‘bundles’ of customer-focused combinations of goods, services, support, self-service, and knowledge”. In operations management, Neely (2008) argued that servitization implies the innovation of an organization’s capabilities and processes so that it can better create value through a shift from selling products to selling product-service systems. In the field of innovation management, Chesbrough (2011) noted that the move towards services and, particularly, the resulting increase in customer focus can be seen as an innovation of the business model and an adoption of open service innovation practices.

According to the scholars pioneering this research, services enrich the product marketing strategy ^{xvi} and boost customer satisfaction, thereby providing manufacturers with an opportunity to distinguish themselves from the competition.^{xvii} These arguments were inspired by seminal contributions in the field of marketing, where the value of the intangible aspects of products was put forward and services were described as an advanced layer of augmented product offering.^{xviii} Furthermore, since this innovation in the product (and service) offering is based, in part, on tacit knowledge, it is more difficult to copy.^{xix} The financial performance effects, such as additional growth opportunities characterized by higher profit margins and stable revenue streams, were expected to follow from the arguments on customer

satisfaction and subsequent competitive advantage.^{xx} These ‘economic’ rationales gain in importance as products move across the life cycle and become more standardized; introducing services can be seen as a way of transcending competitive dynamics based on price alone.

While one section of the literature suggests that services offer high value potential, more recent empirical findings indicate that, in practice, service business development entails complex implementation challenges that – if not managed properly – may even result in a decline in overall firm performance, the so-called ‘service paradox’.^{xxi} Building on case study research, several authors have identified obstacles including lack of attention from top management^{xxii}, deficiencies in organizational design^{xxiii} and information technology^{xxiv}, and lack of an appropriate culture – including insufficient capabilities – in service management.^{xxv} Those studies that assess servitization in a more quantitative manner show that this trend has a mixed impact on economic performance, confirming that engaging in services does not, in itself, guarantee quick gains and that careful implementation is needed.^{xxvi}

Importance of the performance measurement systems

The importance of performance measurement systems (PMS) has been widely acknowledged.^{xxvii} This importance pertains to all functional areas.^{xxviii} At the same time, PMS may serve different purposes in an organization: performance measurement systems help to formulate, communicate and implement strategy throughout the organization; they are used to control and influence behavior in the organization and guide the strategic planning process.^{xxix} Finally, contributions point to the use of PMS in performing a more diagnostic control function through goal setting and measurement of actual results, as well as in stimulating organizational

learning.^{xxx} In general, PMS is used by higher-level managers to influence and steer the behavior of the middle management and successive layers of the organization.

The relevance and effectiveness of the performance measurement systems developed for manufacturing firms have been questioned within service sectors.^{xxxi} Early work on performance measurements in services concentrates mainly on service productivity^{xxxii}, service quality^{xxxiii}, customer satisfaction^{xxxiv}, and provider-customer relations in general.^{xxxv} More recent research argues for the necessity of measuring performance in service development and innovation.^{xxxvi} Several service industries – such as financial services^{xxxvii}, communications^{xxxviii}, and hospitality^{xxxix} – received considerable attention regarding their PMS development. While these service-oriented contributions have complemented PMS literature by proposing indicators for ‘pure’ service providers, a research gap still remains to be closed in terms of designing PMS for product-service providers.

Indeed, authors propose a number of operational measures: customer-focused metrics, such as the waiting times for technical assistance, diagnosis and the delivery of parts; and internally focused metrics, such as fill rates and parts obsolescence costs, which can quantify the way companies use their service assets.^{xl} Some also argue for activity-based performance measures to be translated into outcome-based performance indicators^{xli}; they maintain that performance also needs to be defined and measured on the level of a service-level agreement.^{xlii} Authors also state that objective measures need to be supplemented with subjective measures for assessing service experiences^{xliii}, and with measures of customer satisfaction and employee satisfaction.^{xliv}

While the measures for operational performance and customer satisfaction have been thoroughly examined, product-service providers are facing a performance measurement gap concerning market performance, which is especially important given the threat that the service paradox poses. Thus, we focus on revealing measures that track different aspects of market performance and, therefore, help manufacturers to successfully, and in a sustainable manner, make the transition from product provider to product-service provider.

ATLAS COPCO: MANUFACTURER TURNED PRODUCT-SERVICE PROVIDER

Research design. To understand the nature of service performance in an industrial, product-driven enterprise, we engaged in a three-year study of a multinational equipment manufacturer. The firm under study, Atlas Copco Compressor Technique, which we refer to as Atlas Copco, represents the largest business unit of the Atlas Copco group, the renowned provider of industrial productivity solutions.

We have opted for an inductive case-study design given the nature of the phenomenon. Throughout the study, we were particularly interested in understanding how performance measures were designed and used to steer the business towards services.^{xlv} To understand both aspects – design and use – we adopted a multi-level study design within one firm.^{xlvi} The design of the PMS was studied at the level of corporate headquarters where responsibility lay for defining the PMS, while the use was assessed through a study of sales and service subsidiaries where responsibility lay for implementation of the servitization strategy. We thoroughly studied 10 subsidiaries and conducted more than 100 interviews overall. Multiple, comparative

case studies allow for replication logic and result in an enriched understanding of the dynamics at play.^{xlvi}

Throughout the course of the study, we have collected both quantitative and qualitative data that allowed us to understand how Atlas Copco designs and utilizes performance measures.^{xlvii} Quantitative data consisted of the different performance measures that senior management used to evaluate the performance of subsidiaries. Qualitative data encompassed the interview data with senior management involved in designing the measures. These interviews were aimed at understanding the motivation and logic behind the choice and construction of measures. Qualitative data also included interview data with the subsidiary's management. This data informed us about the perceived advantages and disadvantages of (the various measures generated as well as how the measures are used to steer employee behavior.

Case selection. The choice of the firm has been both deliberate and representative. Atlas Copco is active in more than 100 countries and employs over 14,000 people worldwide^{xlviii}. Consolidated annual revenues exceed 4 billion USD, with the contribution of the service business amounting to around 40 percent. The company has been gradually diversifying towards services over the last decade. Having engaging in these business model innovations, Atlas Copco has achieved outstanding financial performance and has continued to significantly outperform the competition (see Figure 1).

Figure 1. Atlas Copco's financial performance over time

----- INSERT FIGURE 1 ABOUT HERE -----

Atlas Copco's product offering encompasses an assortment of equipment types that complement each other so that a wide variety of industrial applications is covered for tens of thousands of customers. For the majority of customers – in most cases, industrial manufacturers themselves – these products represent investment goods that will remain part of their production systems for many years to come. Given the duration and complexity of their products, Atlas Copco's product portfolio offers significant potential for servicing. Service market opportunities range from the sale of spare parts and ad-hoc repairs to maintenance agreements with varying degrees of coverage (e.g. from preventative maintenance to maintenance plans with wide coverage of operational and financial risks). Besides promoting more advanced service agreements for customers, Atlas Copco has concentrated in recent years on several service products that offer further optimization of customer's operations, such as remote monitoring and optimization of energy consumption. Furthermore, the firm has been developing service offerings that also cover the functioning of related machinery, aimed at improved reliability and reduced energy costs of the entire functional group of products (e.g. besides services for its core product offering, Atlas Copco offers services for related products such as driers, and servicing for competitor products as well).

High-quality products and technological excellence have always been at the heart of Atlas Copco's strategy. Opting for differentiation rather than price competition¹ made Atlas Copco more attentive to the needs of customers in the first place. Innovative products and customer-centricity won Atlas Copco the position of industrial leader. The choice of a decentralized organizational structure^{li} followed the adoption of a customer-centric strategy that placed responsibility for the provision of products and

services in the hands of the network of country subsidiaries, which assumed full responsibility for their local, national markets.

“The relationship with the customer tells us every day how well we perform and, for sure, keeps us alert to all the changes in the market.” Ronnie Leten, CEO Atlas Copco Group.

Headed by a General Manager (GM), each subsidiary is responsible for establishing and maintaining market presence with a full spectrum of product and service activities in a given country market. While accountable for the implementation of the corporate strategy in the local market, the GM has considerable autonomy on how to accomplish this. Adaptations of the global strategy – in order to fit the needs of customers in the local market – are allowed and even expected. In addition, country subsidiaries are divided into different business divisions, each of which represents a certain market segment (e.g. small equipment, large equipment and services). These divisions have their own sales representatives and business line managers (BLMs) who report to their divisional head at headquarters level as well as to the country GM.

Data collection. The first step in our research was to understand the purpose and design of service performance measures at the headquarters level. The principal investigator interviewed three vice-presidents for services, two vice-presidents for products in three different divisions, together with ten product and service managers. The informants were asked about a) the constructs or the aspects of the business that they felt were important to measure and b) their perspectives on performance measurement design, including potential shortcomings of the available performance measures. In parallel, the principal investigator collected and analyzed the data used to develop these performance measures in order to understand whether there were any

shortcomings in the way data was being collected. For this purpose, meetings with the financial director, the head of accounting, three business controllers from the accounting department, and four IT experts were organized.

After collecting and analyzing information from headquarters, the focus of the analysis switched to subsidiaries that were sales and service units of Atlas Copco in different countries. To understand managerial practices, including the interpretation, implementation and use of performance measures, we engaged in over 90 interviews with managers of 10 subsidiaries based in developed and developing countries. Several ideas on how to approach and measure certain business objectives emerged at the subsidiary level rather than from the headquarters. This period was interspersed with regular meetings with management at headquarters, where the principal investigator reported the study's progress to the president for services on a monthly basis.

Data analysis. To obtain an accurate picture of the subsidiaries and to structure this wealth of collected data, we began by mapping different activity systems. We undertook a systematic mapping of the activities and processes inspired by the service blueprinting technique where we distinguished between front and back-office roles.^{lii} For all core processes identified in this manner, we verified whether their outcomes were captured in current performance indicators. Consequently, this approach allowed us to arrive at a comprehensive set of performance indicators (i.e. the outcomes of all core processes are captured to a considerable extent by the set of proposed indicators).

Given that we had sales and service subsidiaries from a single parent company providing the same range of products and services and sharing similar organizational characteristics, we were able to design a generic activity system that contained all

activities for each subsidiary contributing to the sale and provision of both products and services.

The activity system map was instrumental in understanding how each type of market performance outcome specified by the headquarters was used or implemented by the subsidiaries. For example, we could see that, when the products sales force was selling services, their incentive system tended to steer this activity more towards a given type of service while the pure service sales force would be more likely to steer towards another type of service. Data analysis culminated in the comparison of practices used by the subsidiaries and their market performance; as discussed in the remainder of the article, it was clearly very important to incentivize the organization to focus simultaneously, and to an equal extent, on all aspects of performance. In the process of validation, we relied on feedback from senior management at headquarters level, including the CEO. Their profound expertise in the subject area and extensive knowledge of country subsidiaries increased our understanding of the information presented by the informants.

FROM PRODUCT HERITAGE TO SERVICE SUCCESS VIA MEASURES

Heritage – product market performance measures

Similar to most manufacturing firms, Atlas Copco relied predominantly on market share to track market performance on products. Divisional responsibility at headquarters level imposed regular tracking of market share, which was introduced into the senior management incentive schemes of country subsidiaries. Market share was also strongly reflected in the GM's compensation. Market share was calculated at

a very granular level, almost for each product type. Strategic choices, such as decisions with respect to the distribution channel structure (e.g. the number and choice of distributors), were optimized according to their impact on market share. Similar practices were used to assign territories to the sales forces and were reflected in the incentive systems.

Besides market share as a dominant KPI, the GMs and BLMs were also responsible for customer satisfaction and the overall financial performance of the country subsidiary. This focus on customer satisfaction and full financial responsibility (in addition to market performance responsibility) encouraged entrepreneurial behavior at subsidiary level and led to the development of local strategies. This process has encouraged the development of service activities as a means of developing customer relationships and achieving customer loyalty at the subsidiary level. Services first grew 'locally' and, as they developed into a lucrative support activity, became part of the formal strategy of the firm as a whole. A similar trend was replicated over the large majority of subsidiaries, with subsidiaries in developed European markets leading the way. The appearance of services as an autonomous and emergent strategy by subsidiaries was, in due course, translated into an induced service strategy pursued and reinforced by corporate headquarters.

The evolution of market performance measures for services

Atlas Copco's service approach began to evolve around two goals: first, to establish an ongoing service contact with each of its customers; and second, to develop a more elaborate and customized service offering for each customer. This process, labeled 'climbing the service ladder', was seen as a way of ensuring strong relationships and customer intimacy. In order to promote services, headquarters introduced a reporting

structure that tracks sales and gross profits separately for products and services rather than bundles service contributions with product contributions.

At the same time, while service sales and gross profit data ensured a certain level of transparency, they represented merely a starting point for the development of market performance indicators and inspired managers to develop performance measures specific to service businesses. It took a considerable period of trial and error in approximate performance assessment of subsidiaries to eventually distil core business goals for services. Finally, Atlas Copco decided to complement existing indicators with novel ones that allowed the following questions to be addressed:

- How many, or what proportion of, customers are purchasing services?
- To what extent has the average *service* customer adopted our service portfolio?

or

- How well are we covering the service potential of each customer (e.g. does the average customer buy a maintenance service contract with compressor performance optimization or does he just buy spare parts)?

These two questions capture the constructs that underlie Atlas Copco's service business. On the one hand, Atlas Copco is interested in understanding the proportion of existing customers who buy a single service. This indicates the extent to which Atlas Copco maintains continuous interaction with its customer base through services compared to product interaction on an ad-hoc, occasional basis. On the other hand, Atlas Copco seeks to expand the scope of services that each customer buys. In this way, Atlas Copco remains cognizant of the 'quality' of continuous relationships conceived.

The two constructs are seen as complementary. Together, they indicate both the prevalence (breadth) and the quality (depth) of the relationship with the customer. At the same time, the two goals reflected in these measures are underpinned by different approaches to service sales and delivery and, hence, exhibit certain organizational trade-offs. In the sections that follow, we disentangle these issues and discuss the implications in terms of the design and application of performance measures.

“Within our service operations, we need to have a strong relationship with the customer; we have to understand the customer’s needs and his constraints in order to deliver service products that he wants. There is a strong possibility that a satisfied customer will continue to buy our products and services; on the other hand, if we disappoint our customers with our service support, they will seek other suppliers.”
Andrew Walker, President of Atlas Copco Compressor Technique Service Division.

Service adoption

Service adoption is the construct that answers the first question: What proportion of our customers buy services? This ratio captures the extent to which an organization has established a service relationship in its desired market; it is expressed as a proportion of the installed base of customers who engage in service transactions.

Given its strategic decision to focus on services that are closely related to its products and customers, Atlas Copco made a decision to consider its existing products, customers, and the products sold to them as the installed base. At the same time, for manufacturing firms that intend to extend the scope of their service strategy beyond the existing installed base of products, service adoption can be calculated over the

desired installed base. For example, if an equipment service provider were to target all customers with a need for compressed air solutions, its service adoption would be calculated to encompass its installed base of clients and products as well as those of its competitors. Put simply, service adoption represents a service equivalent of the (product) market share and answers how well the service business competes against other service providers who are targeting a manufacturer's (or broader) installed base of products and customers. These competitors range from specialized equipment service providers, facility maintenance companies, competing product-service providers and distributors to even customer 'in house' servicing.

Service adoption also represents an important indicator from the perspective of the product business strategy. Given that the product life cycle is usually lengthy, service encounters are the only point of contact between the manufacturer and its customers over this time period. For products, service adoption represents a measure of the relational strength with the customer base and may, therefore, provide a safeguard against product competition.

"In order to understand how effective we are in servicing our customers, we need to know our customer base; when we know this, and how many of these customers we touch base with every year, then we begin to measure the success of our service business." Andrew Walker, President of Atlas Copco Compressor Technique Service Division.

Service coverage

Whereas 'service adoption' answers the question: *What proportion of customers adopt services?*, 'service coverage' provides the answer to a complementary question:

How well does our service portfolio cover the overall needs of the average customer with whom we have established a service relationship?

Atlas Copco's strategy was focused primarily on excelling in product-related services. Its subsidiaries, routinely selling more elaborate service contracts such as total responsibility plans and performance-based service plans, were successfully working to provide more comprehensive coverage of customers' needs by optimizing the operation of their machines. First-rate coverage of a customer's needs would also imply high capture of market potential and, therefore, higher service revenues. Furthermore, manufacturing firms that, in addition to product-related services, decide to focus on customer-related services such as financing, consulting, or operating machinery on behalf of customers may realize greater potential in covering customer needs and attaining service revenues through expansion of service coverage. On the other hand, subsidiaries that confine themselves to the provision of spare parts, leaving it to the discretion of customers to service their equipment, cover only a subset of customers' operational needs and, hence, capture a lower portion of service market potential.

Moreover, higher levels of service coverage ensure that the company remains present in the mind of the customer. As prior studies have shown, maintaining a close relationship with the customer is instrumental in expanding the product business as well. Having an intimate knowledge of customers' needs, the manufacturer-turned-service provider is not only more likely to become involved when replacing equipment becomes appropriate, but he can spot opportunities to sell related products and even replace competitors' products. As services tend to postpone the purchase of replacement products, this may become a fundamental source of revenue and growth for a product-service provider^{liii}.

The price level of the service offering is another important factor in service coverage, given that the ‘intangibility’ of services invites varying practices in service pricing. For example, a number of subsidiaries occasionally underpriced their service offerings to promote products that these services accompanied. Subsidiaries using this practice might be able to reach high levels of service adoption but they would also face lower service coverage, revenues and profit margins for service activities. These practices sometimes went unnoticed by headquarters: while they could easily monitor product sales’ pricing through the transfer price mechanism, the pricing of services was largely in the hands of the subsidiary’s management (as was the production of services). Service coverage helped capture and penalize this behavior.

“Service coverage tells us how much we are represented in the ‘decision mind’ of the customer. It is important to understand where we stand, what potential we have or what we have missed, and raises the question why we have not been able to sell our service.” Ronnie Leten, CEO of Atlas Copco Group.

Measuring interdependencies between products and services

The nature of the interdependencies

By complementing its existing measure of product performance – market share – with new measures of services performance – service adoption and service coverage – Atlas Copco adopted a performance measurement system that tracks the performance of the service business as well as the product business. At the same time, these indicators do not fully account for the nature of the relationship between product and

service offerings. The complexity of the product-service relationship stems directly from the simultaneous presence of both complementary and conflicting forces.

A key issue that many manufacturers face as they servitize is the concern that services could cannibalize products. For example, by increasing product-life spans through services, opportunities for new product sales can be reduced. This cannibalization leads to tensions between those responsible for product revenues and those responsible for service revenues. More specifically, if one considers product and service activities over the product's lifetime, it becomes apparent that the nature of the relationship between products and services depends on the type of service offering and the phase of the life cycle. Pre-sales services such as consulting, design, customization, installation, and transport enable product sales – provided they are of satisfactory quality. Similarly, services that accompany the product sales process, such as financing and leasing, are likely to facilitate the sale of products. Certain types of after-sales service that are focused on optimizing customer's operations – rather than on the product directly – can have a similar positive impact on immediate products sales. These services could be directly targeting energy costs, risks of down time and other costs associated with product functioning. Examples of these services include monitoring, energy and resource scans.

Finally, after-sales services that directly target product functioning usually represent the most dominant category in terms of revenue potential. In the short term, services such as repairs and maintenance support the product business by helping to promote and sell products. In the long term, they support the manufacturer in three ways. First, provided that the quality of servicing satisfies the standards set, customer satisfaction increases the chance that the customer will choose an existing provider for the replacement of his/her asset. Second, a presence in the customer's facility increases

the chance of selling additional, related products. Third, a presence in the customer's facility increases the chance of replacing equipment from other manufacturers. In this sense, one observes complementarities between product and service activities.

Unfortunately, however, the story does not end here. Further inspection of after-sales services suggests a gloomier outlook. While bundling products with maintenance may increase the likelihood of initial sales, the primary objective of maintenance is to postpone the purchase of subsequent products, thereby directly affecting the product business in the period to follow. This substitution effect increases with the sophistication of services offered: while spare parts and consumables are sold directly to replace miscellaneous parts of the asset, comprehensive overhauls – especially at the end of the life cycle – postpone replacement of the product.

Looking closely at services, the story becomes even more complex. Existing products represent the base for service and a direct source of service potential. In addition, manufacturers may be able to introduce product and process innovations resulting in a more cost-efficient product, which lowers the relative attractiveness of servicing in comparison to purchasing a replacement product. Hence, simultaneously offering products and services does not only imply the presence of positive spillovers between both activities; substitution effects will be present to some extent and may even prevail in organisations that do not address these interdependencies effectively.

Solution to the complex interdependencies: complementarity index

To address this issue, Atlas Copco management required a means of tracking whether product and service activities, taken as a whole, turn out to be complements or substitutes. When two businesses – product and service – nurture a good relationship, they manage to capitalize on cross-selling opportunities. For example, the product

salesperson will inform the service salesperson about the product he/she has sold so that the service salesperson can follow up with his/her offering. At the end of the life cycle, the service technician and the service salesperson will make a joint assessment of the optimal time for a customer to stop servicing and replace the existing product with a new one. They will inform the product salesperson, who will follow up with his/her offering. Multiplied by thousands of customers and interventions a year, a good relationship between the two businesses will lead to complementarity, and sales will co-develop.

On the other hand, the product and service salespersons can also play 'tit-for-tat' games. For example, if a product salesperson decides to optimize his/her sales offering and price by arguing that the product requires no servicing, he/she will fail to promote service sales and may even block them intentionally. Similarly, the service technician and salesperson can propose endless makeovers of an older machine, even when it is of no benefit to either the customer or the manufacturer taken as a whole (when both product and service objectives are accounted for). In this case, product sales will be associated with a decrease in service sales and vice versa.

Unfortunately, capturing these dynamics at the level of a single product/service transaction is very hard, as it would require a separate audit to establish whether there were sales opportunities that had not been captured. Nevertheless, on the level of a subsidiary that sells thousands of products and services, this is more feasible. Since a desired state would imply complementarities prevailing over substitution, the nature and extent of interdependencies can be captured by means of variables that reflect the degree of association between product and service sales, a so-called 'complementarity index'.

We used the annual sales of services and products on the subsidiary level – over 10 years – to calculate correlation coefficients that can range between -1 and +1, signaling a negative, substitutive or positive, complementary relationship between both sales activities. The same analysis could be performed on monthly sales, weekly sales or even on the level of individual salespersons so long as sufficient observations are present for each unit of analysis ($n > 10$). Subsidiaries that nurture complementarities between products and services promote rather than hamper each other's sales and, hence, display a positive complementarity index. On the other hand, firms that allow substitution to supersede complementarity will exhibit an overall negative score. Finally, scores around zero are also important signals, as they reveal that potential spillovers are not, in fact, being enacted. Using correlation coefficients for the complementarity index is attractive because the measure is normalized, well suited for numerical variables and widely available in software package offering spreadsheet functionality.

An empirical analysis at Atlas Copco using the complementarity index reveals that, on the whole, a positive relationship between products and services prevails. However, the complex and potentially conflicting nature of the relationship was known to stimulate short-term trade-offs and sub-optimization, and so the management commissioned an inspection at the level of individual subsidiaries. An assessment at the level of subsidiaries revealed considerable variance, with several subsidiaries even displaying negative scores. The case study analysis of these subsidiaries confirmed the presence of sales practices where sales opportunities for services were sacrificed for product sales (and vice versa). Similarly, case-study research revealed correspondence between positive values of the complementarity index and the presence of integrative mechanisms: subsidiaries with a high positive

index deploy integrative mechanisms and are characterized by constructive, mutually beneficial relationships between product and service areas.

The complementarity index was at first seen as a rather peculiar measure. One of its obvious shortcomings is that, in providing a measure of whether the positive or negative relationship prevails, it does not identify directly the negative interactions that might have occurred on the level of individual transactions, even if the overall ‘sum’ of interactions on the level of the subsidiary is positive. At the same time, Atlas Copco management recognized that it would be practically impossible to inspect individual interactions; the complementarity index was seen as a useful tool to reveal these crucial yet hard-to-measure interdependencies between the two businesses. It was also effective as a signal to all employees of the importance that top management attaches to the collaboration between the product and service businesses.

“Product sales and service sales are inextricably linked together; both are required in order to have a successful business; in Atlas Copco, we believe that having a separate service operation is the best way to keep the customer satisfied, but we never lose sight of the fact that we need future equipment sales in order for our customer base to continue growing.” Andrew Walker, President of Atlas Copco Compressor Technique Service Division.

MEASURES IN USE

The importance of the integrated view

Together, the three service-oriented performance measures complement product-oriented performance measures such as market share in covering the market

performance of a product-service provider. Service adoption and service coverage reveal performance specific to the service market, while the complementarity index depicts the actual nature of the relationship between the product and service businesses. Joint representation of service adoption and service coverage in the form of a matrix helps to visualize the state of the service business and its relation to the product business (Figure 2). This also allows Atlas Copco's management at headquarters level to craft specific development targets for each of the subsidiaries according to its actual performance profile.

Subsidiaries in the bottom left-hand corner clearly need to 'grow' in terms of service activities. Though the growth trajectory is left to the discretion of a subsidiary, service business development begins, as one might expect, with the attainment of service adoption based on basic service offerings and then progresses to higher levels of service coverage through upgrades of this offering. The subsidiaries that have already achieved high(er) service adoption but have low levels of service coverage can be found in the bottom right-hand quadrant. Their 'growth' mission implies achieving higher levels of intimacy by offering more sophisticated services to their broad service customer base. On the other side, subsidiaries in the upper left-hand corner achieved high service coverage by offering sophisticated services but only to a subset of clients. These units will be encouraged to forge relationships with a greater number of customers, even if they have to do so by offering more basic service packages. Finally, subsidiaries in the upper right-hand quadrant have attained service business targets but have, at the same time, reached saturation point in the existing, integrated service business model. These subsidiaries have managed to cover most of the existing installed base of products with sophisticated services, and the creation of new growth opportunities requires certain changes to the existing business model. To

continue the growth trajectory in these subsidiaries, the manufacturer is ready to evaluate other innovation options, such as further developing products based on service experiences or even considering open service innovation initiatives in unrelated areas. An alternative could be to instruct these subsidiaries to focus on process innovation and to concentrate on achieving higher profit margins – a strategy advisable in saturated markets.

Besides the position on the matrix, which reveals the state of the service business, it is important to keep track of the nature of the relationship with the product business, depicted by the color and the form of the sign. While a positive relationship reinforces market success on both product and service sides, negative interdependency can be an early sign of conflict between the two businesses, which can eventually lead to the erosion of both businesses.

Figure 2: Service performance of subsidiaries

----- INSERT FIGURE 2 ABOUT HERE -----

While all subsidiaries need to pay attention to each and every indicator, the question remains how priorities are set from a dynamic perspective. Successful subsidiaries seem to emphasize service adoption initially (i.e. being present with services for a larger group of customers) and then gradually switch the focus to service coverage. An argument in favor of this growth path resides in the observation that service organizations that are still emerging will do a better job in providing basic services. Also, building good relationships with the customer and demonstrating the ability to offer basic services may well be a prerequisite for the customer to develop a trustful relationship with the service provider. That being said, successful subsidiaries have also made sure they follow up with more sophisticated service offerings and, hence,

increase their service coverage as soon as the organizational conditions and customer relationships facilitate such a move.

The presence of this integrated set of performance measures is also relevant for developing incentive schemes and organizational mechanisms for integration. For example, subsidiaries that do not track service coverage nor offer incentives related to service sales are running the risk that their sales force (particularly if it is a product and service sales force) will sacrifice services in order to sell products, where they receive recognition through higher market share as well as through incentives (commission). On the other hand, if a company tracks service coverage and rewards service sales equally, a salesperson is much less likely to favor products over services and will opt for the solution that addresses the needs of the customer most effectively.

Likewise, the requirement for complementarity between products and services needs to be clearly communicated, measured and incentivized. In this respect, some of the subsidiaries offered cross-commissions for product and service salespersons. When a service salesperson contributed to selling a product, he would be rewarded with a percentage of the commission and vice versa. Service technicians were also incentivized through different types of rewards (e.g. miles, gifts or monetary rewards) to generate sales leads, both for products and services.

On the other hand, some successful subsidiaries decided to forego monetary incentives and opted for integration mechanisms to ensure complementarity. The integrative mechanisms were usually organized as a team-building event focused on developing a team among the product salespersons, service salespersons and service technicians.

The dangers of using performance measures in isolation

Clearly, the aforementioned performance measures are complementary and jointly indicate both the prevalence (breadth) and the quality (depth) of service relationships with customers. In addition, the customer complementarity index provides an indicator of the quality of the relationship between the product and the service sides of the business. At the same time, the importance of an integrated view becomes apparent once it is realized that these measures – when considered in isolation – may result in certain trade-offs and, hence, need to be balanced and assessed jointly. Customer segmentation represents one of the key factors facilitating this process of balancing and ensures that the organization optimizes on the level of an integrated set of objectives as well as in response to the specific needs of customers. Segmentation allows subsidiaries to identify which customer segment has the potential to increase breadth through ‘economy offerings’, characterized by low price and basic services; and which customer segment is best placed to offer depth through a premium service offering.^{liv}

Yet, we have noted that subsidiaries, in isolated cases, can prefer one performance measure over another. Using a performance measure in isolation is problematic because each of the measures sheds light on a separate aspect of performance and calls for action that provides a specific remedy for that aspect of performance. Not only does this isolated focus on a performance measure lead to neglect of other performance aspects but the optimization of one performance area can sometimes occur at the expense of another performance area. For example, to optimize service adoption alone, a service BLM would prefer a *basic* one-size-fits-all service offering (e.g. spare parts or repairs) offered at competitive (low) prices. On the other hand, boosting service coverage alone would require an entirely different set of strategic

choices. First, pricing schemes would need to be set sufficiently high in order to achieve adequate levels of service revenue and cost recovery. Second, optimizing service coverage is probably easier to accomplish by focusing on a small/limited number of receptive clients, which contrasts with the large-scale approach that is aimed for with basic service offerings. To sum up, having been presented with a performance measurement system that incorporates potential trade-offs, subsidiaries are forced to look for an organizational solution that balances breadth (service adoption) with depth (service coverage).

Besides the complex relationship described earlier, the fact that service and product business performances fall under the direct responsibility of separate managers (product and service BLMs) is another reason to view the complementarity index as one of the crucial measures of overall business effectiveness. Since a product BLM is rewarded mainly on the basis of product performance and a service BLM is rewarded largely on the basis of service performance, by acting at the level of their individual goals and objectives, representatives of either business could conceivably take daily decisions that jeopardize the other activity and/or sub-optimize returns for the firm as a whole. Given that the relationship itself may imply value creation or value destruction, it is therefore necessary to monitor it. To assess the relevance and implications of use (and abuse) of the integrated PMS, it is instructive to take a look at several subsidiary examples that illustrate the performance outcomes arising from a neglect of, or an over-emphasis on, different types of performance measure.

Over-emphasizing market share and service adoption. Firms that focus very strongly on market share while neglecting any aspect of service performance miss the opportunity to capitalize on service market potential. More specifically, over-focusing on market share may prompt them to sell very basic services and to provide service

offerings at a discount, which also helps them to sell products more easily. Organizationally, this strategy has been observed when the general management of subsidiaries is 'product-focused', i.e. favoring the performance of product activities (over service activities).

Over-emphasizing service coverage. Product-service providers may also go too far too quickly in the other direction. For example, guided by the best intentions to adopt a service orientation, two subsidiaries concentrated on sophisticated offerings only. Over-focusing on service coverage made the subsidiaries concentrate on top-tier customers, trying to supply them with state-of-the-art service offerings. In contrast, basic service offerings seemed less interesting and less lucrative, and the subsidiaries were not prepared to go the extra mile to design and implement sales strategies that would suit 'cost-sensitive' customers. This practice led to lost opportunities to develop customer segments from the bottom up, starting with basic services and progressing to more sophisticated ones.

Lack of focus on the complementarity index. In addition to the emphasis placed on different product or service performance measures, there were differences across subsidiaries with respect to the attention paid to the complementarity index. Some subsidiaries regarded the relationship between the two businesses as a black box; the GM would independently communicate with product and service BLMs who would, in turn, manage their businesses separately. Once the complementarity index was calculated, it revealed differences between subsidiaries. Those that nurtured the product-service relationship had a highly positive correlation index, while those that neglected this relationship and allowed trade-offs to occur had a highly negative index. In subsidiaries that had a complementarity index close to zero, the two

activities did not hamper each other; at the same time, cross-selling opportunities were not being grasped.

(EVEN MORE) CUSTOMER ORIENTATION AND OPEN INNOVATION

As they move towards services, manufacturers may find themselves increasingly aware of the need to be even more customer-oriented. Soon after adopting a more comprehensive approach to their service business by adopting a comprehensive set of performance indicators, Atlas Copco's management became increasingly aware of what was happening on the front line. A focus on the front line, in turn, amplified the need to pay even greater attention to customers' needs, and the management decided to become more proactive in tracking customer satisfaction (e.g. instead of a periodical survey, they opted for an immediate survey after a product or service encounter). Appropriate investments were made and a system to track customer satisfaction on a more detailed level for both products and services was put in place. As the customer surveys began to indicate, services had a decisive impact on customers' perception of the Atlas Copco brand. After the customer satisfaction project was completed, management began to adjust reporting so that they could track the life cycle value – which consisted of products and services – for every individual asset. The measurement of the life cycle represented a new frontier in understanding the value that products and services create for the company as well as for the customer, with the implication of spurring future innovations in both products and services.

Finally, open service innovation – and the resulting potential for customer orientation – may lead to new ideas for product innovation. At Atlas Copco, ongoing investment

in service systems has also led to the capture of new insights relevant to the product business. For example, service technicians offered comments on the serviceability of the products and any improvements that could be made in product functioning. A customer satisfaction survey resulted in insights concerning further product improvements. Gradually, organizational links between the service organization's technical support team and the R&D division began to develop to ensure that knowledge was shared. In this respect, our preliminary observations suggest that a measure of service innovation (e.g. a composite index of various investments in service capabilities and systems) should complement standard R&D-based product innovation measures. As in the case of business performance, firms should also consider monitoring the links between product and service innovation activities, in order to maximize positive spillovers. Accordingly, open service innovation and open product innovation begin to represent a value creation engine with double gears: on the front line and in the back office.

CONCLUSIONS

The aim of this study is to offer an integrated perspective on market performance measurement for manufacturing firms that engage in service business model innovation. According to our research, service-related market effectiveness represents a critical performance aspect for two reasons. First, for services to be accepted as a business and to merit subsequent investment rather than be treated as a support function, they first need to demonstrate value potential. Second, possible conflicting objectives between products and services require management practices, including performance measurement systems, that capture the nature of interdependencies between the two activities. The research on both the design and use of PMS suggests that crafting an inclusive PMS integrating both product and service perspectives of

market performance is crucial for the success of the product-service provider. We find that two indicators, service adoption (breadth of service presence) and service coverage (depth of service presence), capture service value and complement market share as an indicator of product market effectiveness. In addition, the complementarity index assesses the quality of the relationship between the two businesses and the nature of the interdependency that they forge.

Beyond customer orientation, the first priority for senior management seeking to develop the service business is to understand and raise organizational awareness of the relevant market performance constructs. Knowing each aspect, and being aware of all the important performance aspects that ought to be measured, is of the utmost importance since assessing only one aspect of performance may lead an organization to focus on too narrow a subset of goals and, consequently, achieve suboptimal results. Furthermore, in the process of implementing a service business model (as well as any new business model), transparency is the key ingredient in decision-making and effective implementation. Consider, for example, a service manager asking for a budget for investment in new service equipment or training; being able to demonstrate current performance and potential is key to securing the necessary funds. Finally, accurate service performance measurements are necessary to properly devise appropriate reward systems for salespersons. A salesperson that is offered a fair commission on both products and services will be less likely to give away services to sell a product or play down the need for servicing when selling a product, thereby hurting service business prospects.

Our study has several implications for academics as well as practitioners. Firstly, the Atlas Copco experience suggests that a focus on customer relationships should be the starting point – and a core motivation behind the development of the service business

– but it is not in itself sufficient. Besides investing and monitoring customer satisfaction with, and loyalty to, products as well as services, the manufacturer needs to put in place market performance measurement systems that reflect products as well as services. The Atlas Copco case suggests that it is important to monitor the breadth of service interactions with the customer base as well as the depth of the service portfolio offered to these customers. Success in doing so is further reinforced by the fact that Atlas Copco’s client base counts tens of thousands of customers, a large organization that is much more challenging to servitize than the more project-oriented company that has been routinely studied as an example of integrated solution provision.^{lv}

While Atlas Copco’s service strategy remains closely related to its existing product customers – and the service portfolio to its products – the measures themselves can be customized to reflect broader conceptions of the service strategy and the service portfolio. The Atlas Copco story represents one type of effective service strategy but it is not the only possible strategy; other manufacturers may decide that their overall strategy requires more aggressive development of their service businesses. The decision on how much to extend the service strategy and the portfolio should be a function of the opportunities in ‘more distant’ service markets and the capabilities and other investments that the service provider needs to compete in those markets. We very much hope our work inspires future work on performance indicators covering a wider variety of servitization strategies.

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